ARAC ESHWG REPORT 25.1357

1 - What is underlying safety issue addressed by the FAR/JAR?

The safety issue addressed by FAR/JAR 25.1357 is the use, functional requirements and installation requirements of electrical circuit protective devices.

2 - What are the current FAR and JAR standards?

Current FAR text:

Section 25.1357 Circuit protective devices.

(a) Automatic protective devices must be used to minimize distress to the electrical system and hazard to the airplane in the event of wiring faults or serious malfunction of the system or connected equipment.

(b) The protective and control devices in the generating system must be designed to de-energize and disconnect faulty power sources and power transmission equipment from their associated busses with sufficient rapidity to provide protection from hazardous over-voltage and other malfunctioning.

(c) Each resettable circuit protective device must be designed so that, when an overload or circuit fault exists, it will open the circuit irrespective of the position of the operating control.

(d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight.

(e) Each circuit for essential loads must have individual circuit protection. However, individual protection for each circuit in an essential load system (such as each position light circuit in a system) is not required.

(f) If fuses are used, there must be spare fuses for use in flight equal to at least 50 percent of the number of fuses of each rating required for complete circuit protection.

(g) Automatic reset circuit breakers may be used as integral protectors for electrical equipment (such as thermal cut-outs) if there is circuit protection to protect the cable to the equipment.

Current JAR text:

JAR 25.1357 Circuit protective devices.

(a) Automatic protective devices must be used to minimize distress to the electrical system and hazard to the aeroplane in the event of wiring faults or serious malfunction of the system or connected equipment. (See ACJ 25.1357(a))

(b) The protective and control devices in the generating system must be designed to de-energise and disconnect faulty power sources and power transmission equipment from their associated busses with sufficient rapidity to provide protection from hazardous over-voltage and other malfunctioning.

(c) Each resettable circuit protective device must be designed so that, when an overload or circuit fault exists, it will open the circuit irrespective of the position of the operating control.

(d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight. Where fuses are used, there must be spare fuses for use in-flight equal to at least 50% of the number of fuses of each rating required for complete circuit protection.

(e) Each circuit for essential loads must have individual circuit protection. However, individual protection for each circuit in an essential load system (such as each position light circuit in a system) is not required.

(f) Revoked

(g) Automatic reset circuit breakers may be used as integral protectors for electrical equipment (such as thermal cut-outs) if there is circuit protection to protect the cable to the equipment.

3 - What are the differences in the standards and what do these differences result in?

The JAR references ACJ 25.1357(a), which adds interpretative material stating that effects of variations in ambient temperatures on either the protective device or the equipment it protects must not result in hazards. This is in line with current industry practice.

The JAR also has the text formerly located in sub-paragraph (f) moved to be included in sub-paragraph (d). This change was made to avoid any confusion that may be created regarding whether the spare fuse requirement also applied to fuses that are inaccessible in flight. This change has not been done in the FAR, but there is no difference in interpretation.

4 - What, if any, are the differences in the means of compliance?

Since the JAR standard is in line with current industry practice, the means of compliance is the same, with the addition of showing what effect temperature variations have on the circuit protection and the equipment it protects.

5 – What is the proposed action?

The proposed action is to adopt JAR 25.1357 into FAR and to incorporate its related ACJ 25.1357(a) into FAA advisory material.

6 - What should the harmonized standard be?

The harmonized standard should be:

FAR/JAR 25.1357 Circuit protective devices.

(a) Automatic protective devices must be used to minimize distress to the electrical system and hazard to the airplane in the event of wiring faults or serious malfunction of the system or connected equipment. (See ACJ 25.1357(a).)

(b) The protective and control devices in the generating system must be designed to de-energize and disconnect faulty power sources and power transmission equipment from their associated busses with sufficient rapidity to provide protection from hazardous over-voltage and other malfunctioning.

(c) Each resettable circuit protective device must be designed so that, when an overload or circuit fault exists, it will open the circuit irrespective of the position of the operating control.

(d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight. Where fuses are used, there must be spare fuses for use in-flight equal to at least 50% of the number of fuses of each rating required for complete circuit protection.

(e) Each circuit for essential loads must have individual circuit protection. However, individual protection for each circuit in an essential load system (such as each position light circuit in a system) is not required.

(f) Revoked

(g) Automatic reset circuit breakers may be used as integral protectors for electrical equipment (such as thermal cut-outs) if there is circuit protection to protect the cable to the equipment.

[Note: The reference to ACJ 25.1357(a) specified above in paragraph (a) is for JAR only.]

7 - How does this proposed standard address the underlying safety issue (identified under #1)?

The proposed standard will ensure that there is no confusion about spare fuse requirements for use in-flight and that temperature effects are considered when specifying circuit protection.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?

The proposed standard will maintain the current level of safety by ensuring that there is no confusion regarding spare fuse requirements for use in-flight and that temperature effects are considered when specifying circuit protection.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?

The proposed standard is in line with current industry practice and therefore will maintain the current level of safety.

10 - What other options have been considered and why were they not selected?

Consideration was given to standardize on the FAR requirements. That option was not selected because it would have allowed the continuation of the confusion regarding the spare fuse requirement, and it does not address consideration for the effect of temperature variation on circuit protection devices and the equipment they protect.

11 - Who would be affected by the proposed change?

The proposal is in line with current design practices and the effect of the change is considered to be minimal for aircraft operators, modification centers, service centers and manufacturers.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?

None

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?

Existing FAA advisory material does not explicitly address consideration for the effect of temperature variation on circuit protection or on the equipment protected. Therefore, the ESHWG recommends incorporating the ACJ 25.1357(a) into the FAA advisory material.

14 - How does the proposed standard compare to the current ICAO standard?

This proposal is in line with ICAO Annex 8 Chapter 8 Electrical Systems.

15 - Does the proposed standard affect other HWG's?

This proposal does not affect other HWG's.

16 - What is the cost impact of complying with the proposed standard?

Since this standard is in line with current industry practice, the cost impact is considered negligible.

17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?

Yes.

18 – In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process?

The ESHWG considers that the Fast Track Process is appropriate for this proposed rule.